Name:

at1117paper: Complete the Square (v322)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 54 feet. Their combined area, found by adding the square's area and the rectangle's area, is 792 square feet. What is the value of x?

Example's Solution

$$x^2 + 54x = 792$$

To complete the square, add $\left(\frac{54}{2}\right)^2 = 729$ to both sides.

$$x^2 + 54x + 729 = 1521$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 27)^2 = 1521$$

Undo the squaring.

$$x + 27 = \pm\sqrt{1521}$$

$$x + 27 = \pm 39$$

Subtract 27 from both sides.

$$x = -27 \pm 39$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 12$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 30 feet. The total area, of the square and rectangle, is 504 square feet. What is the value of x?

$$x^2 + 30x = 504$$

$$x^2 + 30x + 225 = 729$$

$$(x + 15)^2 = 729$$

$$x + 15 = \pm 27$$

$$x = 12$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 14 feet. The total area, of the square and rectangle, is 120 square feet. What is the value of x?

$$x^2 + 14x = 120$$
$$x^2 + 14x + 49 = 169$$
$$(x + 7)^2 = 169$$
$$x + 7 = \pm 13$$
$$x = 6$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 20 feet. The total area, of the square and rectangle, is 156 square feet. What is the value of x?

$$x^2 + 20x = 156$$
$$x^2 + 20x + 100 = 256$$
$$(x + 10)^2 = 256$$
$$x + 10 = \pm 16$$
$$x = 6$$